Staff Report

ARB Review of the 2008 8-Hour Ozone Attainment Plan for San Diego County

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California Environmental Protection Agency
Air Resources Board

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report presents the Air Resources Board (ARB or Board) staff's assessment of the 2008 8-Hour Ozone Attainment Plan for San Diego County (Ozone Plan) adopted by the San Diego County Air Pollution Control District (San Diego APCD or District) on December 14, 2016. ARB staff has concluded that the Ozone Plan meets all requirements of the Act, as the Ozone Plan includes an analysis of reasonably available control measures, a reasonably available control technology demonstration, a demonstration of reasonable further progress, an attainment demonstration, contingency measures for progress and attainment, and transportation conformity budgets. The Board is scheduled to consider the Ozone Plan on March 23, 2017. If adopted, ARB will submit the Ozone Plan to the U.S. Environmental Protection Agency (U.S. EPA) as a revision to the California State Implementation Plan (SIP).

The federal Clean Air Act (the Act) requires U.S. EPA to set air quality standards and periodically review the latest health research to ensure those standards remain protective of public health. Based on research demonstrating adverse health effects at lower exposure levels, U.S. EPA has set a series of increasingly health-protective ozone standards, beginning with a 1-hour ozone standard in 1979. Subsequent health studies demonstrated the greater effects of exposure to ozone over longer time periods, resulting in U.S. EPA establishing an 8-hour ozone standard of 80 parts per billion (ppb) in 1997, and the 75 ppb standard in 2008. ARB and the District have developed a series of SIPs which detail the actions needed to meet these standards. The SIP process established under the Act has been an important driver for air quality progress in San Diego County.

San Diego County has made significant progress in attaining the federal 1979 1-hour and the 1997 8-hour ozone standards. On June 26, 2003, U.S. EPA determined that the San Diego nonattainment area attained the 1-hour ozone standard by its attainment date[1]. Additionally, on June 4, 2013, U.S. EPA determined that the nonattainment area met the 1997 8-hour ozone standard by its attainment date[2]. The District is making steady progress towards the 2008 8-hour ozone standard. Between 1979 and 2015, the number of days exceeding the standard in the County declined by 95 percent. In 2015, eight out of the nine monitoring sites in the County met the standard, with only the Alpine Drive monitoring station still above the standard.

The Ozone Plan addresses the 2008 federal 8-hour ozone standard of 75 ppb, representing the next building block in planning efforts to meet increasingly health

[1] 68 FR 37976, posted June 26, 2003 and effective July 28, 2003, "Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; 1-Hour Ozone Standard for San Diego County, CA", https://www.gpo.gov/fdsys/pkg/FR-2003-06-26/pdf/03-16029.pdf

[2] 78 FR 33230, Posted June 4, 2013 and effective July 5, 2013, "Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; State of California; Redesignation of San Diego County to Attainment for the 1997 8-Hour Ozone Standard", https://www.gpo.gov/fdsys/pkg/FR-2013-06-04/pdf/2013-13064.pdf

protective air quality standards. Since 1979, the District's ozone strategy has relied on concurrent reductions of oxides of nitrogen (NOx) and reactive organic gases (ROG) emissions from stationary and mobile sources. Continuing reductions in ROG and NOx emissions through implementation of current programs will provide the necessary emission reductions for attainment of the ozone standard by the District's 2018 attainment deadline.

I. BACKGROUND

Ozone is a highly reactive gas that can damage the tissues of the respiratory tract, causing inflammation and irritation, and resulting in symptoms such as coughing, chest tightness, and worsening of asthma symptoms. Ozone exposure can also lead to decreased lung function.

The Act requires U.S. EPA to set air quality standards and periodically review the latest health research to ensure those standards remain protective of public health. Based on research demonstrating adverse health effects at lower exposure levels, U.S. EPA has set a series of increasingly health-protective ozone standards, beginning with a 1-hour ozone standard in 1979. Subsequent health studies demonstrated the greater effects of ozone exposure over longer time periods, resulting in U.S. EPA establishing an 8-hour ozone standard of 80 ppb in 1997, the 75 ppb standard in 2008, and more recently, the 70 ppb standard in 2015.

Effective July 20, 2012[3], U.S. EPA designated San Diego County a Marginal nonattainment area for the 75 ppb 8-hour ozone standard. Marginal areas were required to attain the 75 ppb standard by July 20, 2015. Despite substantial air quality progress, the region did not meet this attainment deadline. Consequently, on June 3, 2016, U.S. EPA reclassified San Diego County as a Moderate nonattainment area, which requires the District to submit a SIP meeting Moderate area requirements, with an attainment date by July 20, 2018[4].

On December 14, 2016, the District adopted the Ozone Plan to address Act requirements applicable to a Moderate 8-hour ozone nonattainment area, consistent with U.S. EPA's 2015 Implementation Rule for the 2008 8-hour ozone standard (Implementation Rule)[5].

II. NATURE OF THE OZONE PROBLEM IN SAN DIEGO COUNTY

The San Diego County ozone nonattainment area lies in the southwest corner of California and encompasses all of San Diego County. The city of San Diego is just 20 miles north of Mexico and 120 miles south of Los Angeles. The climate of San Diego County is classified as Mediterranean, with diverse topography. The climate is dominated by the Pacific High pressure system that results in mild, dry summers and mild, wet winters. The San Diego region experiences an average of 201 days above 70 degrees Fahrenheit. Annual rainfall averages 9-13 inches, occurring primarily between November and March. In recent years, El Niño and La Niña weather patterns

[3] 77 FR 30088; https://www.gpo.gov/fdsys/pkg/FR-2012-05-21/pdf/2012-11618.pdf
[4] 81 FR 26697; https://www.regulations.gov/document?D=EPA-HQ-OAR-2015-0468-0042
[5] 80 FR 12264; http://www.gpo.gov/fdsys/pkg/FR-2015-03-06/pdf/2015-04012.pdf

have significantly affected annual rainfall, as well as overall climatic conditions. September and October often produce some of the hottest days of the year.

Elevated ozone levels occur in San Diego County from the last months of spring through early fall, when high temperatures and stable atmospheric conditions favor ozone formation. Ozone generally reaches peak levels by mid-afternoon and, along with ozone precursors, is often transported inland by the prevailing winds. As a result, inland foothill areas such as Escondido, El Cajon, and Alpine have higher ozone levels and more days exceeding the federal ozone standard than the County's coastal areas.

Design values are used to demonstrate an area's ozone compliance status in relation to the standard. The design value is the 4th high, 8-hour ozone value averaged over three years. **Figure 1** shows the design value for San Diego County which has decreased from 147 to 79 ppb between 1979 and 2015.

Figure 1. Design Value in San Diego County, 1979-2015

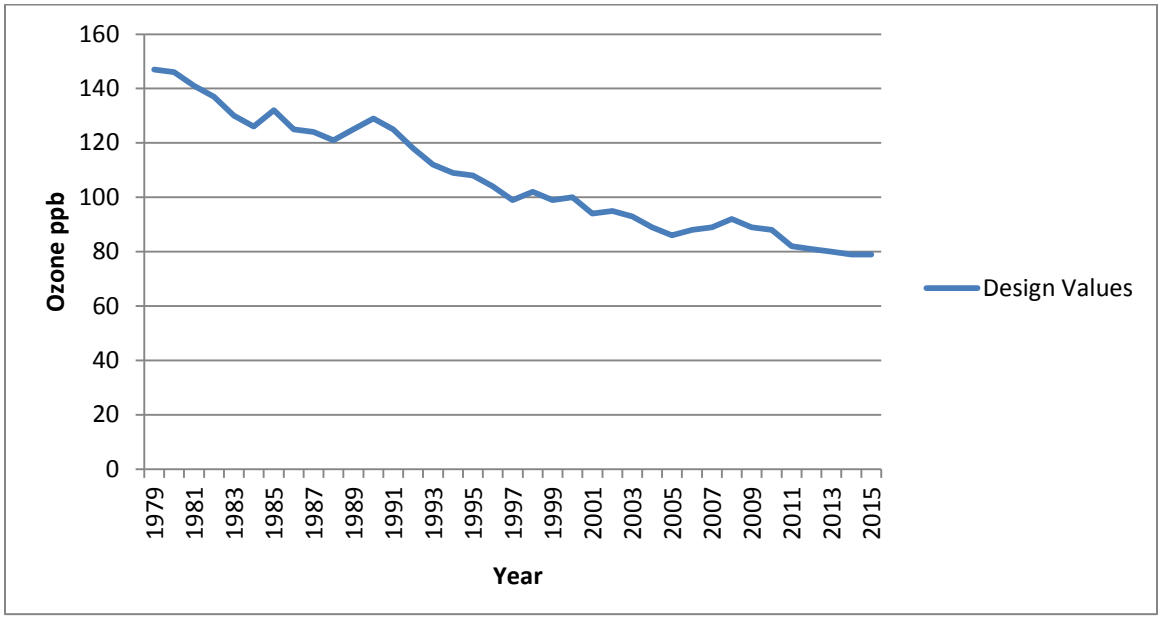
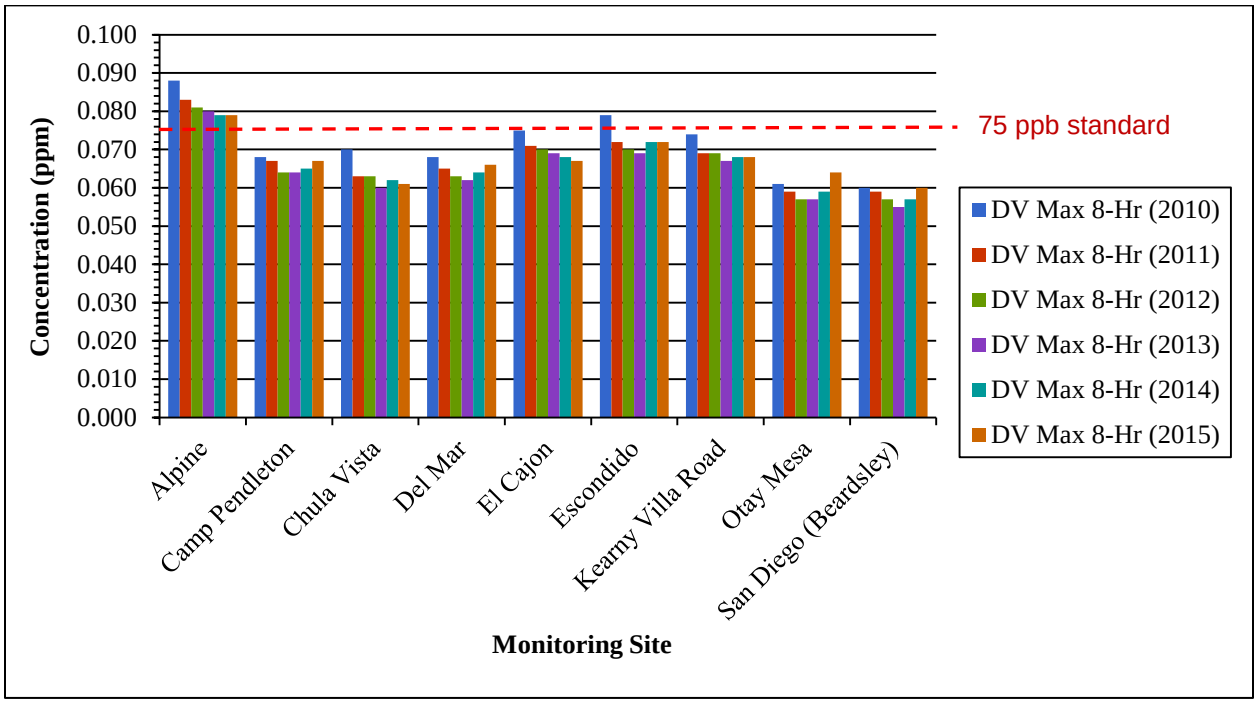


Figure 2 shows the design value concentrations at each ozone monitoring site in San Diego County from 2010 to 2015. Only the Alpine monitoring site continued to have a design value above the 75 ppb standard in 2015.

Figure 2. 8-Hour Ozone Design Value Concentrations at San Diego Monitoring Sites



III. DEMONSTRATING ATTAINMENT

SIPs must identify the magnitude of required reductions, and the actions necessary to achieve those reductions, as part of demonstrating attainment of the standard. The District has provided an attainment demonstration for the 75 ppb 8-hour ozone standard. The attainment demonstration includes the benefits of ARB and District control programs that provide ongoing emission reductions. Continued implementation of these programs provides new emission reductions each year.

The Act requires the use of air quality modeling to relate ozone levels to emissions in a region and simulate future air quality based on changes in emissions. The San Diego County ozone nonattainment area is a part of the greater Southern California modeling domain. As described in Attachment K of the Ozone Plan, the model used in this Plan covers the entire Southern California region and a portion of northern Mexico. The South Coast Air Quality Management District led the modeling effort.

The modeled attainment demonstration in the Ozone Plan was prepared using photochemical and meteorological modeling tools meeting U.S. EPA modeling

guidelines[6], and recommendations from air quality modeling experts. The photochemical model uses emission inventories, with measurements of meteorology and air quality, to establish the relationship between emissions and air quality. The modeling is used to identify the benefits of controlling ozone precursors and the most expeditious attainment date.

Results of the attainment demonstration modeling are shown on **Table 1**. To demonstrate attainment, 2017 design values must be at or below the 75 ppb standard. The design values for monitoring sites within San Diego County have values that range between 59 ppb and 75 ppb, including the design site at Alpine, and therefore meet the 75 ppb standard. Further information on the modeled attainment demonstration is included in Chapter 3 and Attachment K of the Ozone Plan.

Table 1. Modeled 8-Hour Ozone Design Values Demonstrating Attainment (ppb)

Station Name	2012 Base Year Design Value	2017 Future Year Design Value
Chula Vista	61	59
Escondido	70	67
Alpine	80	75
Camp Pendleton	64	63

IV. CONTROL STRATEGY

The ongoing emission reductions from continued implementation of ARB and District control strategies developed to meet prior standards provide the control strategy for the Ozone Plan. Between 2012 and 2017 in San Diego County, NOx emissions will decrease by over 20 percent and ROG emission by over 12 percent. The following sections highlight ongoing ARB control programs and District measures that provide the emission reductions included in the attainment demonstration.

A. ARB Control Program

Given the severity of California's air quality challenges, ARB has implemented the most stringent mobile source emission control program in the nation. ARB's comprehensive strategy to reduce emissions from mobile sources consists of emissions standards for new vehicles, in-use programs to reduce emissions from existing vehicles and equipment fleets, cleaner fuels, and incentive programs to accelerate market penetration of the cleanest vehicles beyond what is achieved by regulations alone. For example, new passenger vehicle, heavy duty truck, and equipment standards, along with cleaner fuel requirements, adopted over the past two decades have achieved reductions which have lead San Diego County toward attainment of the 75 ppb

[6] U.S. EPA, 2014, Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5 and Regional Haze, available at https://www.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

standard. A detailed description of the mobile source control programs and a comprehensive list of ARB regulations are included in Attachments D and E of the Ozone Plan.

B. District Control Program

Consistent with its regulatory authority, the District has adopted rules for reducing emissions from a broad scope of stationary and areawide sources, as detailed in Section 3.1.2 of the Plan and under separate cover in the "2008 8-Hour Ozone Reasonably Available Control Technology (RACT) Demonstration for San Diego County." These rules apply to many stationary and areawide sources, such as factories, power plants, chemical plants, landfills, gas stations, dry cleaners, coating operations, boilers, and furnaces. For example, several current District rules that achieve key reductions regulate the transfer of gasoline into underground storage tanks, as well as aerospace coating operations and stationary gas turbine engines. These rules are implemented through District permits that are specific to each facility or operation, and stipulate the conditions that must be met to ensure compliance. Periodic inspections at the facilities are also conducted by District staff to verify ongoing compliance.

V. CLEAN AIR ACT REQUIREMENTS

In addition to the elements related to the attainment demonstration, the Act also requires SIPs for Moderate ozone nonattainment areas to address the following elements:

- Base year emission inventories and future year forecasts for manmade sources of ozone precursors;
- Demonstration that control measures meet the reasonably available control measures (RACM) level;
- Provisions that demonstrate reasonable further progress (RFP);
- Provisions for sufficient contingency measures for RFP and attainment; and
- Transportation conformity emission budgets to ensure transportation projects are consistent with the SIP.

A. Emission Inventory

An emissions inventory is a critical tool used to evaluate, control, and mitigate air pollution. At its core, an emissions inventory is a systematic listing of the sources of air pollutants along with the amount of pollutants emitted from each source or category over a given time period. The planning emissions inventory is divided into three major categories: stationary, area-wide, and mobile sources. The summer season inventory is used for ozone planning because it reflects the activity levels and conditions presented when higher zone levels occur in the Southern California region.

Table 2 summarizes the 2012 and 2017 emissions inventory for San Diego County. Emissions of NOx are predicted to decline by 27 tpd (24 percent) and ROG by 18 tpd (13 percent), with most reductions coming from on-road mobile sources.

Table 2. San Diego County Base Year and Attainment Year Emissions
tons per day (tpd), summer planning inventory

Source Category	2012 NOx	2017 NOx	2012 ROG	2017 ROG
Stationary Sources	4.4	4.0	29.7	29.2
Areawide Sources	1.8	1.7	36.2	36.7
Mobile Sources (On-/Off-road)	119.1	93.0	72.8	54.9
Emission Reduction Credits	--	0.6	--	0.8
TOTAL	125.2	99.4	138.7	121.6

Source: 2016 Plan, Attachment A: *Emissions Inventories for 2012 and 2017*
Numbers may not add up due to rounding

The Ozone Plan uses a 2012 baseline inventory; the inventory was calibrated to 2012 emissions and activity levels, and inventories for other years are back-cast or forecast from that base inventory. On-road motor vehicle emissions were generated using ARB's mobile source emissions model, EMFAC2014. Off-road mobile source emissions were generated using ARB's OFFROAD model. Both models were developed for use in the ozone SIP revisions, and represent significant improvements over models used in prior SIP updates.

Federal New Source Review (NSR) rules require new and modified major stationary sources that increase emissions in amounts exceeding specified thresholds to provide emission reduction offsets to mitigate the emission growth. Emission reduction offsets represent either on-site emission reductions or the use of banked emission reduction credits (ERC). ERCs are voluntary, surplus emission reductions, which are registered, or banked, with the District for future use as offsets.

Per U.S. EPA policy, ERCs banked before the Ozone Plan's emission inventory base year (2012) must be explicitly treated as emissions in the air. **Table 3** shows the ERCs registered with the District for future use as offsets. Further detail on ERCs is provided in Attachment F of the Ozone Plan.

Table 3. San Diego Emission Reduction Credits, tpd

Pollutant	ERC Total
NOx	0.61
ROG	0.75

Source: San Diego County Ozone Plan

Further detail on San Diego County's emissions inventory is provided in Appendix A, *Emissions Inventory Documentation for the San Diego Nonattainment Area*, of this staff report.

The Act defines Emissions Statement requirements for ozone nonattainment areas classified as Marginal and above. The Act subsection (i) requires states to have an Emission Statement program (i.e., a rule) requiring stationary sources with emissions over 25 tons per year of NOx or ROG to report and certify the accuracy of NOx and ROG emissions, beginning in 1993 and annually thereafter. The Ozone Plan, in Section 2.2, includes documentation to meet the Act emission statement certification requirements.

B. Reasonably Available Control Measures Demonstration

As specified in the Act, the SIP shall provide for the implementation of RACM as expeditiously as practicable to provide for attainment of the ozone standard. RACM must also include emission reductions from existing sources that may be obtained through the adoption, at a minimum, of reasonably available control technology (RACT). The U.S. EPA has interpreted RACM as those emission control measures that are technologically and economically feasible, and when considered in aggregate, would advance the attainment date by at least one year.

Section 3.2 of the Ozone Plan contains a RACM demonstration for State, District, and metropolitan transportation agencies that demonstrate no new measures were identified that would in aggregate advance attainment by from 2017 to 2016. These analyses are further described in Section 3.1 of the Ozone Plan.

C. Reasonable Further Progress Demonstration (RFP)

The Act and the Implementation Rule specify that each ozone nonattainment area must demonstrate ongoing emission reductions relative to the base year (2012). Federal law requires a three percent per year reduction in ROG emissions. Where both ROG and NOx emissions have been shown to contribute to high ozone levels, the Act allows NOx emission reductions to augment ROG emission reductions in order to demonstrate RFP.

Section 3.3 of the Ozone Plan includes an RFP demonstration that meets the Act's requirements. The analysis indicates that the adopted measures from ARB's mobile source program will provide emission reductions beyond those needed for San Diego County's RFP demonstration. As part of the RFP demonstration, the District will rely on a 19 percent reduction of forecasted ROG and NOx emissions (from existing control measures) that are projected to occur between 2012 and 2017. Both ROG and NOx emission reductions are necessary to meet the RFP reduction targets. NOx substitution was used on a percentage basis to cover a two percent shortfall in ROG reduction. Therefore, the RFP requirement is met.

D. Contingency Measures

Contingency measures provide additional emission reductions in the event a nonattainment area fails to achieve RFP targets or to attain the ozone standard by its attainment date. These reductions are additional, since they are reductions not

accounted for in the attainment demonstration. For RFP contingency, U.S. EPA has interpreted this requirement to represent one year's worth of RFP, amounting to three percent of reductions from measures that are already in place or that would take effect without further rulemaking action. San Diego County meets the RFP target in their attainment year of 2017, with a three percent contingency set aside in that year per the requirements of the Implementation Rule.

Since existing mobile source control measures are projected to continue providing significant emission reductions for many years beyond the 2017 attainment year as newer vehicles enter the fleet due to continued implementation of the mobile source programs, the Ozone Plan relies on the continuing emission reductions from those existing mobile source control measures to fulfill the attainment contingency measures requirement. These measures will continue to be implemented as detailed in Section 3.5 of the Ozone Plan.

To meet the three percent emission reduction for attainment contingency, the Ozone Plan relies on additional reductions occurring between 2017 and 2018 from the continued implementation of the mobile source control program, including turnover in the mobile sources fleet. As indicated in **Table 4** below, ARB's ongoing mobile source control regulations will continue reducing San Diego County total ROG emissions between 2017 and 2018 by an estimated 3.6 percent and NOx emissions by about 5.4 percent.

Table 4. San Diego County Projected Mobile Source Emissions, 2017-2018 (tpd)

Source Category	ROG		NOx	
	2017	2018	2017	2018
On-Road Mobile	22	21	41	38
Off-Road Mobile	33	32	52	50
Total	55	53	93	88
Reduction		2		5
% Reduction		**3.6%**		**5.4%**

Source: ARB Emissions Inventory External Adjustments v1.04
Numbers may not add up due to rounding.

E. Transportation Conformity Budgets

Under section 176(c) of the Act, transportation plans, programs, and projects that receive federal funding or approval must be fully consistent with the SIP before being approved by a Metropolitan Planning Organization (MPO). U.S. EPA's transportation conformity rule[7] details requirements for establishing motor vehicle emission budgets

[7] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.

(budgets) in SIPs for the purpose of ensuring the conformity of transportation plans and programs with the SIP.

The Ozone Plan establishes county-level on-road motor vehicle emission budgets for the attainment year of 2017. These emission budgets will also apply to all subsequent transportation conformity years, per the federal transportation conformity regulation. **Table 5** summarizes the motor vehicle emissions budget for transportation conformity purposes under a Moderate federal 8-hour ozone classification. Emission budgets for NOx and ROG were calculated using EMFAC2014 and reflect summer average emissions. Once U.S. EPA approves the emission budgets established in the Ozone Plan, the budgets will serve as the conformity emissions budgets for future transportation conformity determinations in San Diego County. Additional details on the on-road motor vehicle emission budgets can be found in Section 2.1.3 of the Ozone Plan.

Table 5. On-Road Motor Vehicle Emission Budgets
(tpd, summer planning inventory)

Pollutant	2017 and Subsequent Years
ROG	23
NOx	42

VI. ENVIRONMENTAL IMPACTS

The California Environmental Quality Act (CEQA) requires that State and local agency projects be assessed for potential significant environmental impacts. An air quality plan is a "project" that is potentially subject to CEQA requirements. The District found that the Ozone Plan will not result in any potentially significant adverse effects on the environment and is exempt from CEQA under the provisions of section 15061 (b)(3) (the general rule that CEQA only applies to projects which have the potential for causing a significant effect on the environment) and section 15308 (actions taken by a regulatory agency for protection of the environment) of the CEQA Guidelines.

ARB has determined that its review and approval of the Ozone Plan submitted by the District for inclusion in the SIP is a ministerial activity by ARB for purposes of CEQA (14 CCR § 15268). A "ministerial" decision is one that involves fixed standards or objective measurements, and the agency has no discretion to shape the activity in response to environmental concerns. (14 CCR § 15369; San Diego Navy Broadway Complex Coalition v. City of San Diego (2010) 185 Cal.App.4th 924, 934.)

ARB's review of the Ozone Plan is limited to determining if it meets all the requirements of the Act. ARB is prohibited from approving it or changing it unless ARB finds that it does not comply with the Act (HSC § 41650 and 41652). Since ARB lacks authority to not adopt the plan, or modify it, in response to environmental concerns raised through the CEQA process, ARB's action on the plan is ministerial for purposes of CEQA.

VII. STAFF RECOMMENDATION

ARB staff recommends that the Board:

1. Adopt the Ozone Plan, including the emission inventories, attainment demonstration, RACM demonstration, RFP demonstration, contingency measures, and transportation conformity budgets as a revision to the California SIP.

2. Direct the Executive Officer to submit the Ozone Plan to U.S. EPA as a revision to the California SIP.

APPENDIX A

EMISSIONS INVENTORY DOCUMENTATION FOR THE SAN DIEGO NONATTAINMENT AREA

Appendix A

Emissions Inventory Documentation for the San Diego Nonattainment Area 2008 75 ppb 8-Hour Ozone State Implementation Plan

Emissions inventories are one of the fundamental building blocks in the development of a State Implementation Plan (SIP or Plan). In simple terms, an emissions inventory is a systematic listing of the sources of air pollution along with the amount of pollution emitted from each source or category over a given time period. This document describes the emissions inventory included in the 8-hour Ozone Plan for the San Diego County Nonattainment Area, which covers the entirety of San Diego County. It also summarizes the revisions and improvements made to the inventory as part of this Plan.

The California Air Resources Board (ARB) and San Diego County Air Pollution Control District (District) have developed a comprehensive, accurate, and current emissions inventory consistent with the requirements set forth in Section 182(a)(1) of the federal Clean Air Act. ARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emission reports for point sources, and that estimates for mobile and areawide sources are based on the most recent models and methodologies.

ARB also reviewed the growth profiles for point and areawide source categories and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts. Growth forecasts for most point and areawide sources were developed by ARB.

Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and areawide sources such as consumer products and paint. They are fundamental components of an air quality plan, and serve critical functions such as:

1) the primary input to air quality modeling used in attainment demonstrations;
2) the emissions data used for developing control strategies; and
3) a means to track progress in meeting the emission reduction commitments.

The United States Environmental Protection Agency (U.S. EPA) regulations require that the emissions inventory contain emissions data for the two precursors to ozone formation: oxides of nitrogen (NOx) and volatile organic compounds (VOC). The inventory included in this plan substitutes VOC with reactive organic gases (ROG), which in general represent a slightly broader group of compounds than those in U.S. EPA's list of VOCs.

Agency Responsibilities

ARB and District staff worked jointly to develop the emissions inventory for the San Diego Ozone Nonattainment Area. The District worked closely with operators of major stationary facilities in their jurisdiction to develop the point source emission estimates. ARB staff developed the emission inventory for mobile sources, both on-road and off-road. The District and ARB shared responsibility for developing estimates for the nonpoint (areawide) sources such as consumer products and agricultural burning. ARB worked with several State and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), and the California Energy Commission (CEC) to assemble activity information necessary to develop the mobile and areawide source emission estimates.

Inventory Base Year

The base year inventory forms the basis for all future year projections and also establishes the emission levels against which progress in emission reductions will be measured. U.S. EPA regulations establish that the base year inventory should be preferably consistent with the triennial reporting schedule required under the Air Emissions Reporting Requirements (AERR) rule. However, U.S. EPA allows a different year to be selected if justified by the state. ARB worked with the local air districts to determine the base year that should be used across the State. Since the South Coast Air Quality Management District typically aligns their base year inventory with the data collection period for their Multiple Air Toxics Exposure Study, which was last conducted in 2012, ARB selected 2012 as the base year to maintain consistency across the various plans being developed in the State.

Forecasted Inventories

In addition to a base year inventory, U.S. EPA regulations also require future year inventory projections for specific milestone years. Forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emission reductions due to adopted control measures. ARB develops emission forecasts by applying growth and control profiles to the base year inventory.

Growth profiles for point and areawide sources are derived from surrogates such as economic activity, fuel usage, population, housing units, etc., that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or in some cases, from econometric models. Control profiles, which account for emission reductions resulting from adopted rules and regulations, are derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for mobile source emissions are generated by models that predict activity rates and vehicle fleet turnover by vehicle model year. As with stationary sources, the mobile source models include control algorithms that account for all adopted regulatory actions.

Temporal Resolution

Planning inventories typically include annual as well as seasonal (summer and winter) emission estimates. Annual emission inventories represent the total emissions over an entire year (tons per year), or the daily emissions produced on an average day (tons per day). Seasonal inventories account for temporal activity variations throughout the year, as determined by category-specific temporal profiles. Since ozone concentrations tend to be highest during the summer months, the emission inventory used in the Plan is based on the summer season (May through October).

Geographical Scope

The inventories presented in this Plan include emissions for the San Diego Ozone Nonattainment Area, which consists of the entirety of San Diego County.

Quality Assurance and Quality Control

ARB has established a quality assurance and quality control (QA/QC) process involving ARB and District staff to ensure the integrity and accuracy of the emissions inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). ARB inventory staff works with District staff, who are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Areawide source emission estimates are reviewed by ARB and District staff before their inclusion in the emission inventory. Additionally, CEIDARS is designed with automatic system checks to prevent errors such as double counting of emission sources. The system also makes various reports available to assist staff in their efforts to identify and reconcile anomalous emissions.

Future year emissions are estimated using the California Emission Projection Analysis Model (CEPAM), 2016 SIP Baseline Emission Projections, Version 1.04. Growth and control factors are reviewed for each category and year along with the resulting emission projections. Year to year trends are compared to similar and past datasets to ensure general consistency. Emissions for specific categories are checked to confirm they reflect the anticipated effects of applicable control measures. Mobile categories are verified with mobile source staff for consistency with the on-road and off-road emission models.

A summary of the information supporting the San Diego 8-hour Ozone Plan emissions inventory is presented in the sections below.

Point Sources

The inventory reflects actual emissions from industrial point sources reported to the District by the facility operators through calendar year 2012, in accordance with the requirements set forth in U.S. EPA's AERR rule. The data elements in the 2012 baseline inventory are consistent with the data elements required by the AERR rule. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations.

Table 1 lists the point source categories that occur in the ozone nonattainment area.

Table 1
Point Source Categories

Source Category	Subcategory
Fuel Combustion	Electrical Utilities
	Cogeneration
	Manufacturing and Industrial
	Food and Agricultural Processing
	Service and Commercial
	Other (Fuel Combustion)
Waste Disposal	Sewage Treatment
	Landfills
	Incinerators
	Other (Waste Disposal)
Cleaning and Surface Coatings	Laundering
	Degreasing
	Coatings and Thinners
	Printing
	Adhesives and Sealants
	Other (Cleaning and Surface Coatings)
Petroleum Production and Marketing	Petroleum Marketing
Industrial Processes	Chemical
	Food and Agriculture
	Mineral Processes
	Metal Processes
	Other (Industrial Processes)

The point source inventory includes emissions from stationary area sources, which are categories such as internal combustion engines and gasoline dispensing facilities that are not inventoried individually, but are estimated as a group and reported as an aggregated total. Estimates for the following categories were developed by ARB:

Agricultural Diesel Irrigation Pumps

This category includes emissions from the operation of diesel-fueled stationary and mobile agricultural irrigation pumps. The emission estimates are based on a 2003 ARB methodology using statewide population and include replacements due to the Carl Moyer Program. Emissions are grown based on projected acreage for irrigated farmland from the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP). Additional information on this category is available at: https://www.arb.ca.gov/ei/areasrc/arbfuelcombagric.htm

Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 ARB methodology derived from the OFFROAD model. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/FULLPDF/FULL1-2.pdf

Waste Disposal, Composting Facilities

This category includes emissions from composting facilities that process organic materials via an open windrow composting or aerated static pile processes. The emission estimates are based on a 2015 ARB methodology using facility specific emissions testing or an emission factor derived from testing at composting facilities. Growth is based on California Department of Finance (DOF) population forecasts. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/index2.htm

Laundering

This category includes emissions from perchloroethylene (perc) dry cleaning establishments. The emission estimates are based on a 2002 ARB methodology that used nationwide perc consumption rates allocated to the county level based on population and an emission factor of 10.125 pounds per gallon used. Emissions were grown from the original estimates to 2012 using DOF population growth trends. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/onehtm/one3-1.htm

Degreasing

This category includes emissions from solvents in degreasing operations in the manufacturing and maintenance industries. The emissions estimates are based on a 2000 ARB methodology using survey and industry data, activity factors, emission factors and a user's fraction. Growth for this category is based on ARB/REMI industry-specific economic output. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbcleandegreas.htm

Coatings and Thinners

This category includes emissions from coatings and related process solvents. Auto refinishing emissions estimates are based on a 1990 ARB methodology using production data and a composite emission factor derived from surveys. Growth is based on projected vehicle miles traveled (VMT) from ARB's EMFAC model. Estimates for industrial coatings emissions are based on a 1990 ARB methodology using production and survey data, and emission factors derived from surveys. Estimates for thinning and cleaning solvents are based on a 1991 ARB methodology, census data and a default emission factor developed by ARB. Growth for these categories is projected using REMI county economic forecasts. Additional information on these methodologies is available at: https://www.arb.ca.gov/ei/areasrc/arbcleancoatreproc.htm

Adhesives and Sealants

This category includes emissions from solvent-based and water-based solvents contained in adhesives and sealants. Emissions are estimated based on a 1990 ARB methodology using production data and default emission factors. Growth for this category is based on REMI county economic forecasts. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbcleanadhseal.htm

Gasoline Dispensing Facilities

ARB staff developed an updated methodology to estimate emissions from fuel transfer and storage operations at gasoline dispensing facilities (GDFs). The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The updated methodology uses emission factors developed by ARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based on 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from ARB's on-road mobile sources model (EMFAC). Additional information on this category is available at: https://www.arb.ca.gov/ei/areasrc/arbpetprodmarkpm.htm

Areawide Sources

Areawide sources are categories such as consumer products, fireplaces, and agricultural burning (see Table 2) for which emissions occur over a wide geographic area. Emissions for these categories are estimated by both ARB and the local air districts using various models and methodologies.

Table 2
Areawide Sources

Source Category	Subcategory
Solvent Evaporation	Consumer Products
	Architectural Coatings and Related Solvents
	Pesticides/Fertilizers
	Asphalt Paving and Roofing
Miscellaneous Processes	Residential Fuel Combustion
	Farming Operations
	Fires
	Managed Burning and Disposal
	Cooking

A summary of the areawide methodologies is presented below:

Consumer Products

The consumer products category reflects the four most recent surveys conducted by ARB staff for the years 2003, 2006, 2008, and 2010. Together these surveys collected updated product information and ingredient information for approximately 350 product categories. Based on the survey data, ARB staff determined the total product sales and total VOC emissions for the various product categories. The growth trend for most consumer product subcategories is based on the latest DOF human population growth projections, except for aerosol coatings. Staff determined that a no-growth profile would be more appropriate for aerosol coatings based on survey data that show relatively flat sales of these products over the last decade. Additional information on ARB's consumer products surveys is available at: https://www.arb.ca.gov/consprod/survey/survey.htm.

Architectural Coatings

The architectural coatings category reflects emission estimates based on a comprehensive ARB survey for the 2004 calendar year. The emission estimates include benefits of the 2000 ARB Suggested Control Measures. These emissions are grown based on DOF population forecasts. Additional information about ARB's architectural coatings program is available at: https://www.arb.ca.gov/coatings/arch/arch.htm

Pesticides

DPR develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticides Use Report, which provides updated information from 1990 to the most current data year available. The inventory includes estimates through the 2014 calendar year. Emission forecasts for years 2015 and beyond are based on the average of the most recent five years. Growth for agricultural pesticides is based on ARB projections of harvested acreage provided by the U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS). Growth for structural pesticides is based on REMI projections of expenditures on structures.

Asphalt Paving/Roofing

Asphalt paving and roofing emissions were grown from 1991 estimates, except for cutback asphalt which was grown from 2000 estimates. Emissions are estimated based on tons of asphalt applied and a default emission factor for each type of asphalt operation. The growth profile for both categories is based on county economic forecasts from the REMI forecasting model.

Residential Wood Combustion

ARB staff updated the methodology to reflect 2005 fuel use, and more recent emission factors and calculation approaches. The emission estimates reflect emission factors from U.S. EPA's National Emission Inventory. Growth is based on DOF population forecasts. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocresfuelcom.htm

Farming Operations

ARB staff updated the Livestock Husbandry methodology to reflect livestock population data based on the USDA's 2007 Census of Agriculture, and ammonia emission factors for dairy support cattle. A seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs. Based on an analysis of livestock population trends, no growth is assumed for livestock categories other than feedlot cattle. Additional information on ARB's methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscproclivestock.htm

Fires

Emissions from structural and automobile fires were estimated based on a 1999 ARB methodology using the number of fires and the associated emission factors. Estimates for structural fires are calculated using the amount of the structure that is burned, the amount and content of the material burned, and emission factors derived from test data. Estimates for automobile fires are calculated using the weight of the car and components and composite emission factors derived from AP-42 emission factors. Growth is based on DOF population forecasts. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfires.htm

Managed Burning & Disposal

ARB updated the emissions inventory to reflect burn data reported by District staff for 2008. Emissions are calculated using crop specific emission factors and fuel loadings. Temporal profiles reflect monthly burn activity. Growth for agricultural burning is based on ARB projection of NASS harvested acreage. No growth is assumed for burning associated with weed abatement. ARB's methodology for managed burning is available at: https://www.arb.ca.gov/ei/areasrc/distmiscprocwstburndis.htm
Additional background information is available here:
https://www.arb.ca.gov/ei/see/see.htm

Commercial Cooking

The commercial cooking emissions were grown from a 1996 estimate. The emissions estimates were developed from the number of restaurants, the number and types of cooking equipment, the food type, and default emission factors. The growth profile reflects the latest population projections provided by DOF.

Point and Areawide Source Emissions Forecasting

Emission forecasts (2013 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented below in Table 3.

Table 3
Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Fuel Combustion	Electric Utilities	CEC forecast
	Cogeneration	No growth
	Manufacturing and Industrial Area Source/Natural Gas	CEC forecast
	Manufacturing and Industrial Others	Energy Information Admin (EIA) forecast
	Food and Agricultural Processing Ag Irrigation I. C. Engines	FMMP irrigated farmland acreage
	Food and Agricultural Processing Point Sources	EIA forecast
	Service and Commercial Natural Gas	CEC forecast
	Service and Commercial Other Fuels	EIA forecast
	Other (Fuel Combustion) Diesel	ARB OFFROAD model/DOF population forecast
	Other (Fuel Combustion) Other Fuels	EIA forecast
Waste Disposal	All	DOF population forecast
Laundering	Dry Cleaning	DOF population forecast
Degreasing	All	ARB/REMI industry-specific economic output
Coatings & Thinners	Auto Refinishing	Vehicles from ARB EMFAC model
	Others	REMI county economic forecast
Printing	All	REMI county economic forecast
Adhesives & Sealants	All	REMI county economic forecast
Petroleum Marketing	All	ARB EMFAC model fuel consumption
Petroleum Production & Marketing	All	DOF population forecast
Mineral Processes	All	REMI/Annual Energy Outlook

Table 3
Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
		model
Other Industrial Processes	All	REMI/Annual Energy Outlook model
Consumer Products	Consumer Products	DOF population forecast
	Aerosol Coatings	No growth
Architectural Coatings and Related Process Solvents	All	DOF population forecast
Pesticides/Fertilizers	Agricultural Pesticides	ARB projection of NASS harvested acreage
	Structural Pesticides	REMI structures expenditures
Asphalt Paving / Roofing	All	REMI county economic forecast
Residential Fuel Combustion	Natural Gas	CEC forecast
	Woodstoves & Fireplaces - Wood	DOF population forecast
	Water Heating	EIA forecast
	Cooking	EIA forecast
	Other	EIA forecast
Farming Operations	Livestock/Others	No growth
Fires	All	DOF population forecast
Managed Burning and Disposal	Agricultural Burning, Prunings & Field Crops	ARB projection of NASS harvested acreage
	Weed Abatement	No growth
Cooking	All	DOF population forecast

Stationary Source Control Profiles

The emissions inventory reflects emission reductions from point and areawide sources subject to District rules and ARB regulations. The rules and regulations reflected in the inventory are listed below in Table 4.

Table 4
District and ARB Stationary Source Control Rules and Regulations Included in the Inventory

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
District	69.2	Small Boilers, Process Heaters and Steam Generators	Electrical generation
ARB	ARCH_SCM	Architectural Coatings 2000 SCM	Architectural coatings
ARB	ARB_R003	Consumer Product Regulations & Amendments	Consumer products
ARB	ARB_R003_A	Consumer Product Regulations & Amendments	Consumer products
ARB	ARB_R007	Aerosol Coating Regulation	Consumer products / Aerosol coatings
ARB	GDF_HOSREG	Gasoline Dispensing Facilities - Hose Permeation	Petroleum marketing
ARB	ORVR	Fueling emissions from ORVR vehicles	Petroleum marketing

On-Road Mobile Sources

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using outputs from ARB's EMFAC2014 model. The on-road emissions were calculated by applying EMFAC2014 emission factors to the transportation activity data provided by the local San Diego transportation agencies from the San Diego Association of Government's (SANDAG) 2015 adopted Regional Transportation Plan.

EMFAC2014 includes data on California's car and truck fleets and travel activity. Light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2012 DMV data. The model also reflects the emissions benefits of ARB's recent rulemakings such as the Pavley Standards and Advanced Clean Cars Program, and includes the emissions benefits of ARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2014 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2012 DMV registration data along with updates to mileage accrual using Smog Check data. Updates to heavy-duty trucks include model year specific emission factors based on new test data, and population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state trucks. Additional information and documentation on the EMFAC2014 model is available at: https://www.arb.ca.gov/msei/categories.htm#emfac2014

Off-Road Mobile Sources

Emissions from off-road sources were estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models were developed to support recent regulations, including in-use off-road equipment, ocean-going vessels and others. The sections below summarize the updates made to specific off-road categories.

Ocean-Going Vessels (OGV)

ARB staff updated the OGV activity growth rates and NOx emission calculations in September 2013. These updates reflect more recently available long-term economic forecasts and historical data from 2006 to 2012. The long-term growth factors were updated for container ships, auto ships, tankers, and cruise ships. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Cargo Handling Equipment (CHE)

The emissions inventory for the Cargo Handling Equipment category has been updated to reflect new information on equipment population, activity, recessionary impacts on growth, and engine load. The new information includes regulatory reporting data which provide an accounting of all the cargo handling equipment in the State including their model year, horsepower and activity. Background and supporting documents for the Cargo Handling Equipment Regulation are available here: https://www.arb.ca.gov/ports/cargo/cheamd2011.htm

Pleasure Craft and Recreational Vehicles

A new model was developed in 2011 to estimate emissions from pleasure craft and recreational vehicles. In both cases, population, activity, and emission factors were re-assessed using new surveys, registration information, and emissions testing. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

In-Use Off-Road Equipment

ARB developed this model in 2010 to support the analysis for amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation. Staff updated the underlying activity forecast to reflect more recent economic forecast data, which suggests a slower rate of recovery through 2024 than previously anticipated. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Locomotives

In 2014, ARB developed a revised inventory for line-haul locomotive activity in California. The new model is based primarily on activity data reported to ARB by the major rail lines for calendar year 2011. To estimate emissions, ARB used duty cycle, fuel consumption and activity data reported by the rail lines. Activity is forecasted for individual train types and is consistent with ARB's ocean-going vessel and truck growth rates. Fuel efficiency improvements are projected to follow Federal Railroad Association projections and turnover assumptions are consistent with U.S. EPA projections. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Transport Refrigeration Units (TRU)

This model reflects updates to activity, population, growth and turn-over data, and emission factors developed to support the 2011 amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Fuel Storage and Handling

Emissions for fuel storage and handling were estimated using the OFFROAD2007 model. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Diesel Agricultural Equipment

The inventory for agricultural diesel equipment (such as tractors, harvesters, combines, sprayers and others) was revised based on a voluntary survey of farmers, custom operators, and first processors conducted in 2009. The survey data, along with information from the 2007 USDA Farm Census, was used to revise almost every aspect of the agricultural inventory, including population, activity, age distribution, fuel use, and allocation. This updated inventory replaces general information on farm equipment in the United States with one specific to California farms and practices. The updated inventory was compared against other available data sources such as Board of Equalization fuel reports, USDA tractor populations and age, and Eastern Research Group tractor ages and activity, to ensure the results were reasonable and compared well against outside data sources. Agricultural growth rates through 2050 were developed through a contract with URS Corp. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Mobile Source Forecasting

Table 5 below summarizes the data and methods used to forecast future-year mobile source emissions by broad source category groupings.

Table 5
Growth Surrogates for Mobile Sources

Category	Growth Methodology
On-Road Sources	
All	Match total VMT projections provided by SANDAG
Off-Road Gasoline Fueled Equipment	
Lawn & Garden	Household growth projection
Off-Road Equipment	Employment growth projection
Recreational Boats	Housing starts (short-term) and human population growth (long-term)
Recreational Vehicles	Housing starts (short-term) and human population growth (long-term)
Off-Road Diesel-Fueled Equipment	
Commercial Harbor Craft	Growth rates provided by District, except for tugs and fishing vessels. Fishing fleet growth rates were adjusted to reflect a decline in fish landings. Assumed no growth for tugboats.
Construction and Mining	California construction employment data from U. S. Bureau of Labor Statistics
Farm Equipment	2011 study of forecasted growth by URS Corp
Industrial Equipment	California construction employment data from Bureau of Labor Statistics
Ocean-Going Vessels	Projected commodity tonnage in the Freight Analysis Framework (FAF) Model developed by the Federal Highway Administration
Trains (line haul)	International/premium train growth tied to OGV forecast; Domestic train growth tied truck growth
Transport Refrigeration Units	Projection of historical Truck/Trailer TRU sales from ACT Research, adjusted for recession.